

## Adaptive Compliant Trailing Edge II Sub-Project (ACTE II)

Completed Technology Project (2015 - 2018)



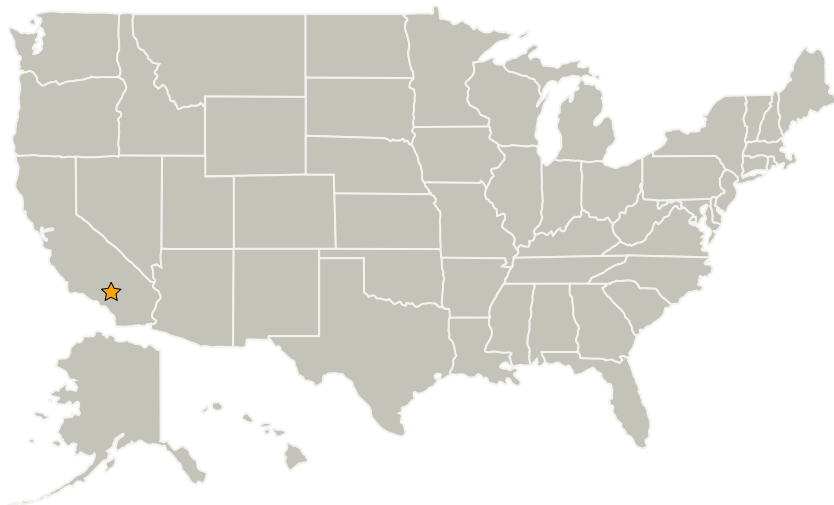
## Project Introduction

The ACTE II Sub-Project is an experimental flight research joint effort between NASA and the U.S. Air Force Research Laboratory in partnership with FlexSys. This effort aims to demonstrate fuel burn reduction, control of wing aerodynamic load distribution, and community noise reduction through the use of seamless, adaptive flap technology at relevant commercial flight conditions. The ACTE efforts began under the Environmentally Responsible Aviation Project and has continued under the Flight Demonstrations and Capabilities (FDC) Project as the ACTE II Sub-Project.

## Anticipated Benefits

Flight testing will characterize the ACTE flap's contribution toward reduced fuel consumption that enables reduced engine exhaust emissions. Primary contributions include drag reduction through the use of variable camber technology to optimize performance throughout the flight envelope, and the use of a more efficient wing surface that does not include drag-inducing gaps and edges. Integrating this technology in new aircraft designs has the potential to reduce the structural weight of the wings to further reduce overall fuel consumption and emissions. A secondary benefit is the airframe noise reduction associated with the seamless flap. This attribute of the ACTE flap was evaluated by the Landing Gear Noise Reduction Sub-Project within the FDC Project.

## Primary U.S. Work Locations and Key Partners



Integrated Aviation Systems Program (IASP)

Adaptive Compliant Trailing Edge II Sub-Project

## Table of Contents

Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Project Website:	3
Technology Areas	3
Target Destination	3

## Adaptive Compliant Trailing Edge II Sub-Project (ACTE II)

Completed Technology Project (2015 - 2018)



Organizations Performing Work	Role	Type	Location
★Armstrong Flight Research Center(AFRC)	Lead Organization	NASA Center	Edwards, California
Air Force Research Laboratory(AFRL)	Supporting Organization	US Government	Notre Dame, Indiana
Aviation Partners FlexSys	Supporting Organization	Industry	

## Project Transitions

▶ **October 2015:** Project Start

✔ **September 2018:** Closed out

**Closeout Summary:** The Adaptive Compliant Trailing Edge (ACTE) II Sub-Project within the Flight Demonstrations and Capabilities (FDC) Project was established to assess key elements of ACTE flap system performance through flight demonstrations on the NASA's Subsonic Research Aircraft Testbed (SCRAT) G-III aircraft. The G-III aircraft, operated out of Armstrong Flight Research Center (AFRC), was modified by replacing the original equipment Fowler Flaps with the ACTE flap system for the planned ACTE II flights. Primary objectives of the ACTE II Sub-Project were the following:

- Expand speed envelope from 0.75 Mach to 0.85 Mach
- Explore "twisted" flap deflection for load alleviation
- Collect noise and drag data for model validation

The ACTE II flight demonstrations were highly successful as they accomplished key objectives while logging significantly more flight hours than originally anticipated. Throughout the flight test campaign, the ACTE flap structure showed no issues even at higher Mach numbers up to 0.85 Mach. Through in-flight investigations of twisted flap performance, it was confirmed that twist can be employed to manipulate the center of pressure to enable the redistribution of loads on a lifting surface. Further, through in-flight drag measurements, ACTE flap drag performance was assessed and characterized to enable the validation of computational models. In addition to proof of concept for this novel flap configuration, the results of the ACTE II Sub-Project confirm that this technology holds promise for increased structural and operational efficiency of future, clean sheet aircraft designs. <https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20180005456.pdf> <http://www.nasa.gov/feature/nasa-flight-tests-advance-research-of-flexible-twistable-wing-flaps-for-improved-aerodynamic>

**Closeout Link:** <https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20180005456.pdf>

## Organizational Responsibility

**Responsible Mission Directorate:**

Aeronautics Research Mission Directorate (ARMD)

**Lead Center / Facility:**

Armstrong Flight Research Center (AFRC)

**Responsible Program:**

Integrated Aviation Systems Program

## Project Management

**Program Director:**

Richard L Noble

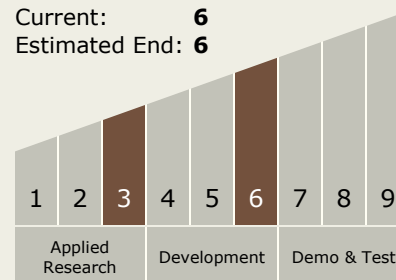
**Project Managers:**

Kevin C Weinert

Brent R Cobleigh

## Technology Maturity (TRL)

Start: 3  
Current: 6  
Estimated End: 6





**Project Website:**

<https://www.nasa.gov/aeroresearch/programs/iasp/fdc>

**Technology Areas**

**Primary:**

- TX15 Flight Vehicle Systems
  - └ TX15.1 Aerosciences
    - └ TX15.1.6 Advanced Atmospheric Flight Vehicles

**Target Destination**

Earth